DOCUMENT RESUME

ED 470 875 PS 030 745

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TITLE	A Comprehensive Approach to Curriculum Development.
PUB DATE	2000-11-00
NOTE	13p.; In: Issues in Early Childhood Education: Curriculum, Teacher Education, & Dissemination of Information. Proceedings of the Lilian Katz Symposium (Champaign, IL, November 5-7, 2000); see PS 030 740. Produced with Laura Weishaupt. Photographs may not reproduce well.
AVAILABLE FROM	For full text: http://ericeece.org/pubs/books/katzsym/rosenthal.pdf.
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	Classroom Environment; *Classroom Techniques; *Curriculum Development; Elementary Education; Parent Role; Student Needs; Student Role; *Teacher Role

ABSTRACT

This paper addresses how educators can encourage elementary-age children to develop critical thinking skills and creativity while also meeting educational standards and maintaining learning goals. The paper notes that a comprehensive curriculum: (1) honors the role of all participants--teachers, children, and parents; (2) engages children in long-term projects and in-depth study; (3) offers opportunities for children to communicate their thinking using a variety of media; and (4) provides a fertile learning environment. The elements of practice used to meet these goals are then described: (1) identifying skills, concepts, and methodology; (2) rich environments and resources; (3) firsthand experiences; (4) representation; (5) discussion and revision; (6) systematic instruction; (7) inquiry/research; and (8) assessment. (Author/HTH)

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A Comprehensive Approach to Curriculum Development

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with Laura Weishaupt

Abstract

This paper addresses how educators can encourage elementary age children to develop critical thinking skills and creativity while also meeting educational standards and maintaining learning goals. The teachers believe that a comprehensive curriculum (1) honors the role of all participants—teachers, children, and parents; (2) engages children in long-term projects and in-depth study; (3) offers opportunities for children to communicate their thinking using a variety of media; and (4) provides a fertile learning environment. The elements of practice used to meet these goals are (1) identifying skills, concepts, and methodology; (2) rich environments and resources; (3) firsthand experiences; (4) representation; (5) discussion and revision; (6) systematic instruction; (7) inquiry/research; and (8) assessment.

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How do we as educators help elementary age children develop critical thinking skills necessary for the 21st century while also meeting educational standards? How do we encourage children's creativity and still maintain learning goals?

These aims for education are not mutually exclusive; rather, all play an essential role in young children's learning. Encouraging children's creativity by offering a variety of ways to represent their thinking helps motivate children and make learning experiences more authentic. Frequent assessments help ensure that learning goals are met and children are appropriately challenged.

But combining these elements into a coherent whole does not happen by accident. What takes place in a classroom or other learning environment is like a performance of an improvisational theater or music group. Endless hours of preparation, thought, and practice go into what appears to be an effortless orchestration.

In this paper, we describe our practices to give a view of what happens backstage, in the planning room, to make possible what takes place on stage, in the classroom. As part of our ongoing planning, we analyze the elements of our practice and offer examples of their use. We also show how the elements are combined through the example of a project we developed with our students.

We believe that by assessing and reflecting on our practices, and being willing to revise and adapt those practices to suit children's learning needs, we can not only meet educational standards but reach beyond them to exercise children's higher-order thinking skills.

The work we describe here is based on our experiences in a K-1 classroom at Corinne A. Seeds University Elementary School (UES), the laboratory school of the UCLA Graduate School of Education & Information Studies. We believe it is relevant for teachers of students at all elementary age levels.

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Educational Philosophy

We believe a comprehensive curriculum:

- Honors the role of all participants—teachers, children, and parents. This element is at the core of our practice. Each child is seen as a strong, competent individual with his or her own cultural experiences, learning styles, and prior knowledge. As Elliot Eisner (1994) states, "It is through our differences that we enrich others" (p. 10). Parents are acknowledged as having ideas that are invaluable to learning experiences in the classroom. The teacher is seen as a researcher, a co-learner with children, and a collaborator with peers. The teacher's role is to acknowledge these strengths and assure that they become part of the classroom experience. Listening to and collaborating with students, colleagues, and parents is an ongoing process and is essential to the teacher's professional growth.
- Engages children in long-term projects and in-depth study.
- Offers opportunities for children to communicate their thinking using a variety of media. With each representation of an idea, set of ideas, or concepts, the child connects meaning and deepens understanding.
- Provides a fertile learning environment. Beyond the aesthetic and functional, a rich learning environment should reflect children's thinking and ideas so as to invite response, provoke discussion, and provide the teacher with data to reflect upon, assess, and plan collaboratively.

A comprehensive curriculum uses all these elements to encourage children to construct their own knowledge while also guiding them toward achieving the larger learning goals. It does so in an environment that reflects the classroom community: child, teacher, and parent.

Methodology

The elements of our practice used to meet these goals form a concentric learning process where all elements are interdependent (see Figure 1). We prepare beforehand with a discussion about concepts and the development of the environment. As we add the children's ideas and experiences, and as we acquire more knowledge from the environment, firsthand experiences, and inquiry, new thoughts arise that adjust our plans. Being flexible allows us to take advantage of learning opportunities, to fill in information for children, and to build on their understanding and inquiry.

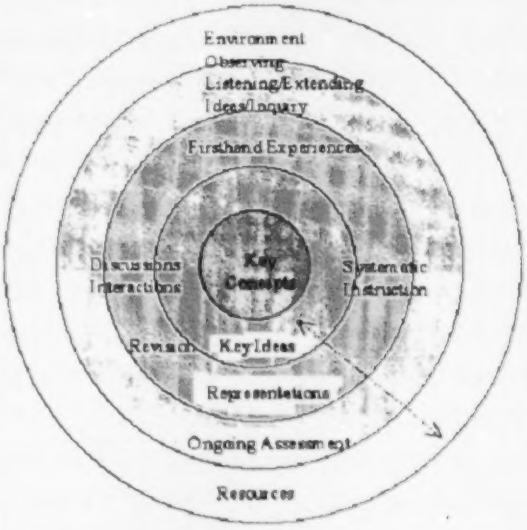

Figure 1. Elements of practice forming a concentric learning process.

Children gain a deeper understanding of concepts through a methodology that is designed to meet their differences. Children build their own knowledge through experiences and discovery rather than by attempting to memorize abstract facts. Their motivation and their opportunities for learning are greater since they are not limited by what the teacher perceives as interesting.

Identifying Skills, Concepts, and Methodology

During the pre-planning process, we identify skills, concepts, and methodology to guide instruction and decide which experiences to offer children to spark curiosity and prompt inquiry. For our science unit, we decided to use plants to illustrate life cycles. The

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California Science Framework recommends that for the plant life cycle, children's observations and experiences include seed germination, pollination, plant growth, survival needs of plant organisms, change, and decomposition. These recommendations formed the basis for the activities we developed. The following is an outline of this process:

Concepts to Develop

- Characteristics of organisms and life cycle of organisms

Guided Framework Questions

- What are the characteristics of living things?
- How do living things change throughout their lifetime?
- What do living things need to live and grow in their environments?
- What is the life cycle of a living thing?

Skills to Develop

- Make observations in the internal/external environment
- Use different resources to research information
- Represent understanding in a variety of media
- Communicate ideas verbally
- Generate inquiry
- Record observations/data
- Make predictions
- Use tools for investigation
- Work independently and cooperatively
- Build vocabulary

Rich Environments and Resources

A classroom should be a comfortable, inviting environment that offers flexibility to allow children to modify the arrangement of spaces as needed for their learning. Children's work is displayed to make their ideas visible and stimulate interactions such as questions, clarifications, explanations, and discussions. Materials and resources are easily accessible so as to foster independence and autonomy. They are specifically suited to support learning goals and to offer opportunities for children to demonstrate understanding.

As teachers, we support exploration and risk taking, thinking beyond the usual. Children's ideas are creatively expressed through their experimentation and use of many different techniques. Unconventional materials and tools are explicitly utilized according to our needs to guide the children toward the learning goals.

In one lesson, for example, children were given jute as a canvas and plant materials collected from their schoolyard to make a collage. Some children tied collections to their work. Some used the jute as a canvas and painted on it. Other children glued plant materials to the canvas. Some of the children used flower petals to graphically represent a plant or tree (see Figure 2). Through this activity, children explored the natural environment. Then they transformed their materials by using them as drawing tools.

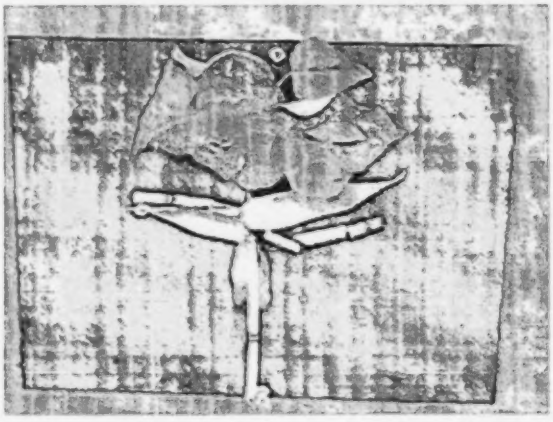

Figure 2. Children used canvas and plant materials to represent a plant.

Firsthand Experiences

Firsthand experiences provide children with the ability to connect prior knowledge with newly acquired knowledge and the opportunity to apply learning to their everyday lives. They also offer interactions to stimulate inquiry and discussions and incentive to research and learn more.

We began the first lesson by asking questions to assess prior knowledge and to provoke thought and exchange:

"Where do we find plants?"
"What do plants need to grow?"
"What things are made from plants?"

The class explored these questions by discussing what they had observed about their home and school environments. We then guided children in conducting experiments to determine optimal conditions for seed growth. They made predictions and then recorded their findings in journals. Using knowledge gained from their experiments, they planted seeds in individual cups, in their gardens at home, and in a communal garden so they could watch them germinate and grow. During a field trip to Descanso Gardens in La Canada, California, the children observed firsthand what they had learned and connected it to their classroom experiences.

Representation

Multiple representations help children: (1) communicate their thinking; (2) deepen their understanding of concepts; (3) see their ideas translated into different languages, such as art, movement, song, and drama, thus cultivating their multiliteracy; (4) provoke interactions, discussions, and inquiry about their work; and (5) access meaning as well as create their own meaning.

We use these representations to assess our process, stimulate creativity, and make visible children's learning. In looking at children's representations, we ask ourselves whether we are providing enough information. Looking at holes in children's work helps us know what holes there are in ours. They give us information about how to plan and allow us to assess the curriculum we have developed. Representations also invite response on the part of other children, teachers, parents, and visitors to the classroom, all of whom contribute to our dialogue and our thinking.

Plant Life Cycle in Animation. For example, children represented their understanding of the life cycle of a plant (from seed to flower) by drawing each stage of the process in a flipbook format. Creating a believable "moving picture" required planning and conceptualizing. Children had to take apart the stages, think about how to draw them, and focus on the details of the process as well as see them as part of a larger whole. The activity also offered opportunities for teachers and children to see how well children were grasping the concepts and where the gaps in their understanding lay. And it provided motivation for the children to seek out resources and do further research to fill in those gaps so they could create workable flipbooks (see Figure 3).

Figure 3. The children created flipbooks to represent their understanding of the life cycle of a plant.

Parts of a Flower in Clay. Children in two classrooms represented their understanding of the parts of a flower two dimensionally in clay. Many of the benefits were the same as for the flipbooks, applied now to the individual parts of the flower. In addition, shaping models from clay gave children a better sense of the physical dimensions of the flower parts (see Figure 4).

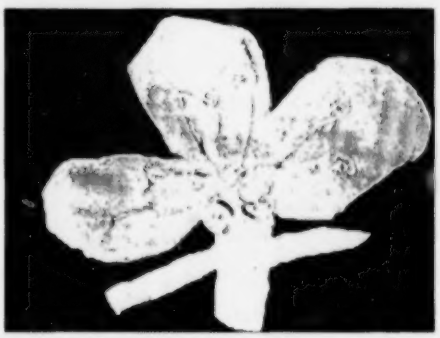

Figure 4. The children represented parts of a flower in clay.

Parts of a Flower in Print. For this activity, children etched the names of the flower parts in foam. When they tried to print their etchings, they discovered that the words were inverted. After the children made several attempts to write the words so they would print legibly, a facilitator asked questions to illicit ideas about how to solve the problem. After discussion, one child came up with a solution—to write the words backwards. The children tested this suggestion and found it successful.

In using language, children learned more about the parts of a flower as well as developed their reading and writing skills. Communicating their ideas helped children refine their thinking and their problem-solving skills. This example also demonstrates a use of lexicon not available in the clay representation. Multiple representations help to broaden the depth of study (see Figure 5).

Figure 5. The children represented parts of a flower in print.

Discussion and Revision

In discussing their work, children (1) gain a deeper understanding of the concept, (2) acquire increased ability to communicate their ideas verbally, and (3) realize the gap in their understanding of the concept. With each revision, their understanding becomes more concrete, and they increase their ability to communicate more clearly.

A discussion between the teacher and a student, Rebecca, is illustrative. As Rebecca was making a print and was ready to label the parts of her flower, the teacher asked her to point to the flower's stamen. Rebecca replied that she wasn't sure which was the stamen and which was the stigma. After the teacher asked her to point to what she thought was the stamen, and reminded Rebecca that a flower has more than one, Rebecca remembered and was able to identify the part.

Similarly, we asked children to draw a line from the flower part to the corresponding word. This identification reinforces children's understanding of the parts of the flower while helping them build a scientific lexicon.

Finally, children created step-by-step graphic representations of the process of pollination in the form of storyboards. As one child explained her drawing to the teacher, the teacher asked the child to clarify her ideas about germination. The child used her body to show how the stem breaks through the seed coat. In communicating through body language, the child demonstrated her understanding and clarified her ideas. She then was able to make revisions to her original storyboard frames (see Figure 6).

Figure 6. Children created representations of the process of pollination in storyboards.

Systematic Instruction

Perhaps the teacher's most important role is to know when and how to provide children with knowledge and resources to take their learning to the next level.

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To accomplish this goal, he or she must constantly make choices about pedagogical approaches, deciding which approach is best suited for the purpose. Oftentimes it will be direct instruction to teach a lesson on a concept that children are confused about or for which other developmentally appropriate resources are not available. Such lessons emerge out of the children's inquiry rather than being planned by the teacher *a priori*.

To determine what knowledge children need to acquire, the teacher listens to their ideas, assesses their work, and plans collaboratively to redefine tasks to meet more specific goals. Throughout the process, it is important that the teacher remain flexible enough to provide materials and resources necessary for on-demand learning.

Inquiry/Research

As children represent and discuss their ideas, inquiry arises. This process intrinsically motivates children and leads them to further investigate and research their questions and ideas.

For example, as one child described her understanding of pollination to her classmates, storyboard in hand, a question arose regarding an idea in her representation. The child had shown that a bee can pollinate two flowers of the same kind in different colors, but some of her classmates disagreed, believing that the two flowers must be of the same color. Motivated to prove her hypothesis, the child sought the most readily available resource, the expertise of the gardener on the school grounds. The gardener confirmed that yes, certain flowers can be pollinated in different colors, thus supplying the information and also demonstrating the value of doing research and going to an authoritative source.

The children's discussion demonstrates one of the values of multiple representations. The more children represent their thinking and talk about their representation, the more often inquiry arises. When children have the opportunity to discuss their representation (such as a storyboard) and communicate about or verbalize what they have done, critical thinking occurs.

Assessment

Both formal and informal assessments reveal to the teacher and student what the child knows and needs to know. They also indicate what the teacher may need to provide to ensure that learning goals are met and knowledge of the concepts are attained. Ongoing assessments are a critical part of the flexible planning process. Many of the methods we have described, such as storyboards and flipbooks, serve as informal assessments. Other methods include direct questioning of a child to see if he or she has grasped content and asking students to draw or write what they know about pollination in their journals.

In the case of the student who read back her storyboard, both she and the teacher noticed that there were steps missing from her explanation of the pollination process. The teacher saw the gaps in the child's understanding of the concept and what the teacher needed to provide to deepen that understanding.

Nature Must Go On! A Long-Term, In-Depth Investigation

Our work on the play Nature Must Go On!, a project the children initiated, provides an illustration of how all the elements and methods we have described above can work together.

During the study of the life cycle of plants, children made various representations in clay, on paper, using the computer, and so forth. With each representation, their understanding deepened. During a discussion about one of these representations, two children suggested that a play be written about the life cycle of plants. Their peers in their own and another K-1 classroom at the school unanimously agreed, and so our in-depth investigation began.

Children conceived the story; wrote the script; and created music, costumes, and sets. Conducted over the course of six months, the children's work on the play resulted in their meeting curricular goals while learning skills and gaining knowledge in science, mathematics, language, critical thinking, and the arts.

Throughout the project, teachers guided instruction and student inquiry, with the teacher playing a "facilitator" role to scaffold student learning and to help children generate and seek answers to specific questions. Rather than directing all learning, they created opportunities for learning by supporting children's own inquiry.

Parents supported the teacher in this role by volunteering in the classroom and using their knowledge and talents to teach specific skills and concepts.

As Sylvia C. Chard (1998) tells us in *The Project Approach,* long-term projects allow us to meld children's ideas and experiences with the learning goals. She writes:

> Children not only need to know *how* to use a skill but also *when* to use it. They need to learn to recognize for themselves the contexts in which the skill might be useful and the purposes it can most appropriately serve. Project work and systematic instruction can be seen as providing complementary learning opportunities. In systematic instruction the children acquire the skills, and in project work they apply those skills in meaningful contexts. The project work can be seen as the part of the curriculum that is planned in negotiation with the children and that supports and extends the more formal and teacher-directed instructional elements. (p. 10)

Inspiring Literature

The school librarian offered inspiration for the play by gathering literature about plants and flowers. The two classes read and discussed stories such as *James and the Giant Peach, Jack and the Beanstalk,* and the *Chalk Box Kid.*

We provided systematic instruction to give the children a foundation for the story-writing process. A parent who is a professional writer visited the classroom to discuss elements of the story. These elements were broken down so that the children could begin to write stories that incorporated problems and solutions, protagonists and antagonists, setting, and so forth.

We then created groups composed of children from both rooms to write stories about the life cycle of plants. Next, the eight stories were presented to both classrooms, and the children democratically voted on their favorite story.

The children chose to produce a story about a magical plant growing out of the roof of a haunted mansion. As they were writing the story, we took the group to look at an old adobe house that had been built on the school grounds by previous students many years ago. After having them observe the foliage growing out of the roof, we asked the children to illustrate their ideas for the story's setting (see Figure 7). The teacher asked the children to describe the characteristics of the plant so they would think about and gain a clearer vision for the "magical plant." One group of children used their bodies to represent their ideas (see Figure 8).

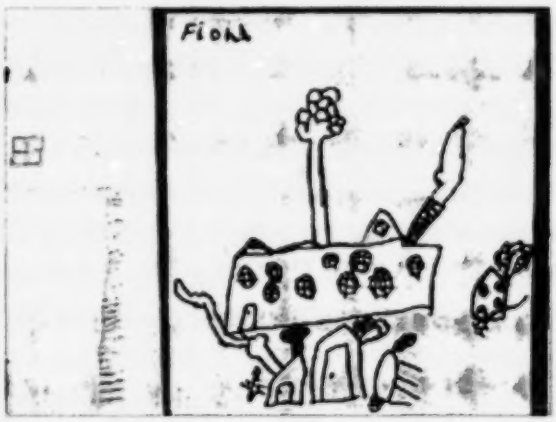

Figure 7. The children illustrated a story about a magical plant.

Writing and Revising the Script

We had many discussions about the differences between a story and a play. What did a story need that a play did not? As children talked about their ideas and the teacher listened, the story was fleshed out. Working this way in a group required that children use negotiation skills. They acted as editors for each other and learned how to listen to and evaluate ideas different from their own. The teacher

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then read the children their original story. New ideas unfolded as they heard their story retold and children made revisions based on the new ideas.

Figure 8. The children used their bodies to represent their ideas about the magical plant.

Because many of the children were learning in both Spanish and English, the class decided that both languages should be represented in the play. Children took turns explaining which characters should be Spanish speaking and which should be English speaking. Then they took a vote to decide, and one child used her math skills to tally the votes.

As children acquired more knowledge about plants and pollination through their learning activities and investigations, they wanted to revise the script to incorporate their newfound knowledge. In all, the script went through five revisions before the final draft was complete. Significantly, these revisions happened organically and out of the children's own motivation. The story grew and developed because the children, guided by their teachers, saw a need for this development.

Revision in Learning

Inspired by a child's questions about what other animals pollinate, the teacher shared additional resources. When children learned that a bat can also pollinate, they insisted a line be added to include this newfound knowledge.

In this example of inquiry, the teacher listened to the child's questions, responded flexibly with new resources, scaffolded the child's thinking, and applied new knowledge. As this newfound knowledge was incorporated into the script, children felt their ideas were heard. Their input contributed to their self-confidence and their investment in the learning process, as well as strengthened their role in it. A similar addition came when the children insisted that their discussion about pollination and the flowers of two different colors also be included in the script.

Composing the Score

The children wanted to incorporate music and song into the play, so the music teacher joined both classes one day each week to help them compose the score. Children helped compose the melody to their song "Pollination." Their lyrics, shown here, are another representation of their grasp of the scientific concepts:

Pollination, pollination,
The bee goes to the stigma
And gets the pollen.
Pollination, pollination,
Flower to flower,
Bees fly in the sun.

Pollination, pollination,
The bee takes the pollen
To the stamen.
Pollination, pollination,
Flower to flower,
Bees fly in the sun.

Writing this lyrical poetry gave children with different strengths an opportunity to use another form of representation to communicate their understanding about pollination.

Exploration of Sound

Nine children formed a committee to produce sound effects for the play. Children became more aware of the sounds around them after a reading of *The Listening Walk*, by Paul Showers. They started thinking about the play and the atmosphere they wanted to create. They decided it needed to be

spooky, scary, and near the ocean. There had to be howling voices, creaking doors, and flapping bats.

Children were asked to bring in something from home that they felt made a sound that would bring the play's setting to life. They suggested that silverware be tied together to create the sound of chimes to represent a magical flower sound. Children practiced making a flapping sound to imitate the flapping wings of a bat.

As part of the investigation of sound, a parent arranged a visit to an echo chamber and its opposite, an anechoic chamber. Back in the classroom, we asked children to draw the rooms they had visited. The drawings provoked discussions about the experience. The children concluded that they must make their sound effects louder than normal so their audience would be able to hear them in the space where the play would be performed. The children's experiences with sound heightened their awareness of the many sounds around them. They developed a more critical ear to differentiate between pitches and sounds.

Casting

Casting for the play needed to accommodate 43 children. After the teachers and children discussed the importance of each role on and off stage, the children were asked to write down their top three choices for the roles they wanted to play. Teachers prepared the children for the inevitable overlapping of choices. Although many did not get their first choice, they learned to compromise.

We also used problem-solving opportunities such as the one related to casting as material for homework exercises. In one homework packet, for example, we presented this question: "In our play, Nature Must Go On!, there are 43 children. If we have 9 musicians, 1 narrator, 3 characters (Michael, Daniela, and Brittany), and 2 magic flowers, how many children do we have left to play all the other parts? Show your thinking."

Character Development

We asked children to research and represent their characters. They used a variety of resources, such as books, magazines, experts, and the Internet. As part of their research, the children were asked to think about how their character moves, what it eats, how it communicates, and so forth (see Figure 9). As children acquired more knowledge about their characters, and became more invested in creating their costumes, they devoted more attention to detail and more time to their representations (see Figure 10).

Figure 9. The children drew their characters.

In Writer's Workshop, children wrote their autobiographies. Because of their investment in the play, they enthusiastically described elements about themselves as well as their characters. They drew these in detail, and we combined them into programs for the play (see Figure 11).

Set Design and Construction

The play takes place in two settings: a haunted mansion by the ocean and a rainforest. The children thought carefully about the design of the sets and drew their ideas. Initially it was important for them to include the following in the set of their haunted mansion: a flower sticking out of the roof, creaking stairs, a graveyard, and a forbidding looking door. As development occurred and children had new ideas, they incorporated these ideas into the play. A woodworking specialist helped the children realize their ideas for the set design by assisting them with measuring, cutting, and constructing. Children gained confidence in seeing their ideas come to life and knowing their ideas were valued.

Figure 10. As the children invested more in creating their costumes, their representations became more detailed.

To incorporate mathematics instruction, we asked children questions involving measurement and estimation. "How wide does the door have to be?" "How many children at a time will be going through it?" To test their ideas, the teacher had the children stand together, two or three across, and then measured their bodies.

Parents and children worked together to build and paint the haunted mansion. Parents from the monolingual and bilingual classrooms were active participants throughout the play's production. Children made new friendships as a result of both classes' long-term collaboration. They engaged in spontaneous discussion regarding the play on the playground, in the bathroom, during recess, and during lunch. Ideas were brewing everywhere.

Rainforest, Scene 2 Design and Construction

After reading *The Great Kapok Tree* and looking through other information and fictional texts about rainforests, the children had a clear idea of what they wanted to include in their design. As they gathered more information about the rainforest, their ideas for the set became more elaborate. Their drawings included vines, exotic animals, and a variety of foliage. These initial drawings became a reference for the elements of the forest and laid a foundation for what developed into more creative imagery (see Figure 12).

Children read about, drew, and painted large leaves and vines for the rainforest scene. Raw, hands-on materials were collected from participating families to save costs. Everything was created and fabricated out of simple sheets and plain, simple sheer fabric. Parents' and grandparents' ideas enriched the children's learning experience and the classroom community (see Figure 13). A grandmother, for example, taught children how to sew.

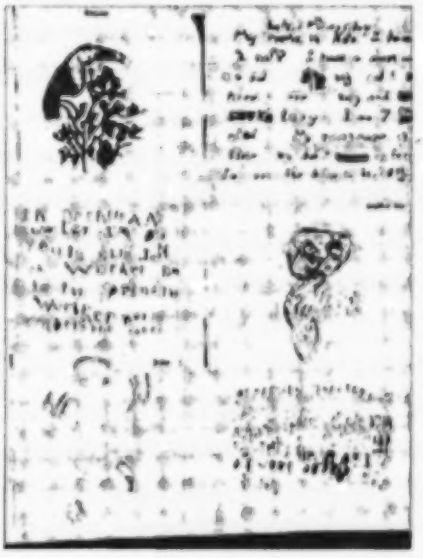

Figure 11. The drawings and descriptions of the children's characters were used in the programs for the play.

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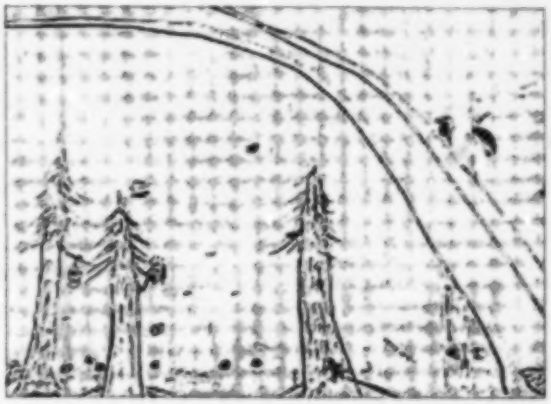

Figure 12. The children designed the rainforest scene.

Figure 13. With help from parents, the children created the rainforest.

Costumes

We engaged in small group discussions and work sessions that covered ideas about creating unconventional, distinguishable features for the characters' costumes. One girl, for example, dressed her body as a butterfly's body and held her "wings." Another girl designed a costume for which she wore a butterfly on her head.

We sculpted most forms from wire and paper or wire and fabric, which were then painted. Children collaborated in the creation and design of their costumes. For example, one child looked at an illustration in *The Great Kapok Tree* for inspiration for her butterfly costume.

The children's design and creation of the imaginary flowers developed as a direct result of their in-depth study of flowers and their parts. Each flower included stamens, stigmas, pistils, petals, and so forth. We encouraged children to create without preconceived ideas about what a typical flower costume would look like. The result was magical (see Figure 14).

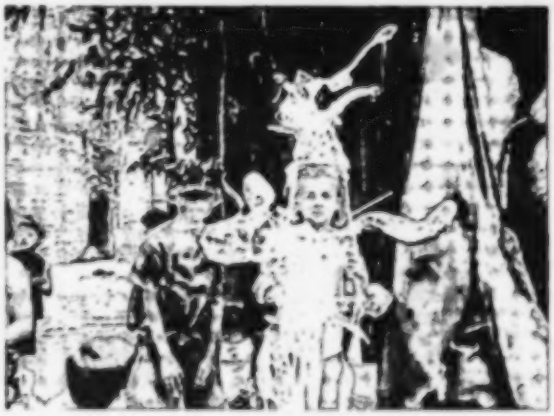

Figure 14. The children designed their flower costumes.

Conclusion

Taking a comprehensive approach to curriculum development offers a variety of learning benefits to both students and teachers. Vital to understanding and being successful with this approach, however, is recognizing that creating a curriculum cannot be done in isolation. When the elements of practice include (1) identification of skills, concepts, and methodology; (2) rich environments and resources; (3) firsthand experiences; (4) representation; (5) discussion and revision; (6) systematic instruction; (7) inquiry/research; and (8) assessment, the resulting curriculum provides children with greater motivation, a deeper understanding of concepts, and more lasting connections with the content material.

Just as every component of a stage production—whether it occurs backstage or onstage—contributes to the overall success of the show, each of the

elements listed above is fundamental to the running of a classroom and to providing children with enriching, stimulating, and successful educational experiences. In showing respect for each child's potential and for his or her capacity, this kind of teaching practice challenges children to do their best and to bring their whole being to the activity of learning. By recognizing them as individuals with valuable knowledge, thoughts, and ideas, a comprehensive approach to curriculum development can nurture and challenge children to reach toward and achieve their potential. The results are learners who achieve to the highest standards possible.

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